Shahjalal University of Science and Technology (SUST)

Department of Electrical and Electronic Engineering (EEE)

4th Year 2nd Semester **Final term** Examination- Deeember 2014

Course Name: Power System Protection **Course Code: EEE- 445**

Full Marks: 100 **Credit: 3.0** **Time: 3 Hour**

(Answer **any two** questions from **Part-A** & **any two** questions from **Part-B**)

Part- A

1. a) What do you mean by switchgear? List some switchgear equipment and hence write down the necessity of an isolator. 2+2+3

   b) Mention the salient difference between Fuse and Circuit Breaker 5

   c) Why does arc is generated when circuit breaker contacts begin to separate? What are the methods of arc Extinction method? Discuss Low resistance or current zero method 3+1+6

   d) Write down the effect of Restriking voltage on the persisting of arc in the next cycle. 3

2. a) Draw the construction and write down the operating principle of Sulphur Hexaflouride (SF6) Circuit Breakers 3+7

   b) Write the advantages and disadvantages of air blast circuit breaker 6

   c) What is Current Chopping? Discuss briefly. 5

   d) How many rating circuit breakers do have? What are they? Write short notes on Resistance switching 4

3. a) With schematic discuss the Merz-Price circulating current scheme for alternator protection 9

   b) Discuss briefly how does torque is produced in an induction relay? 7

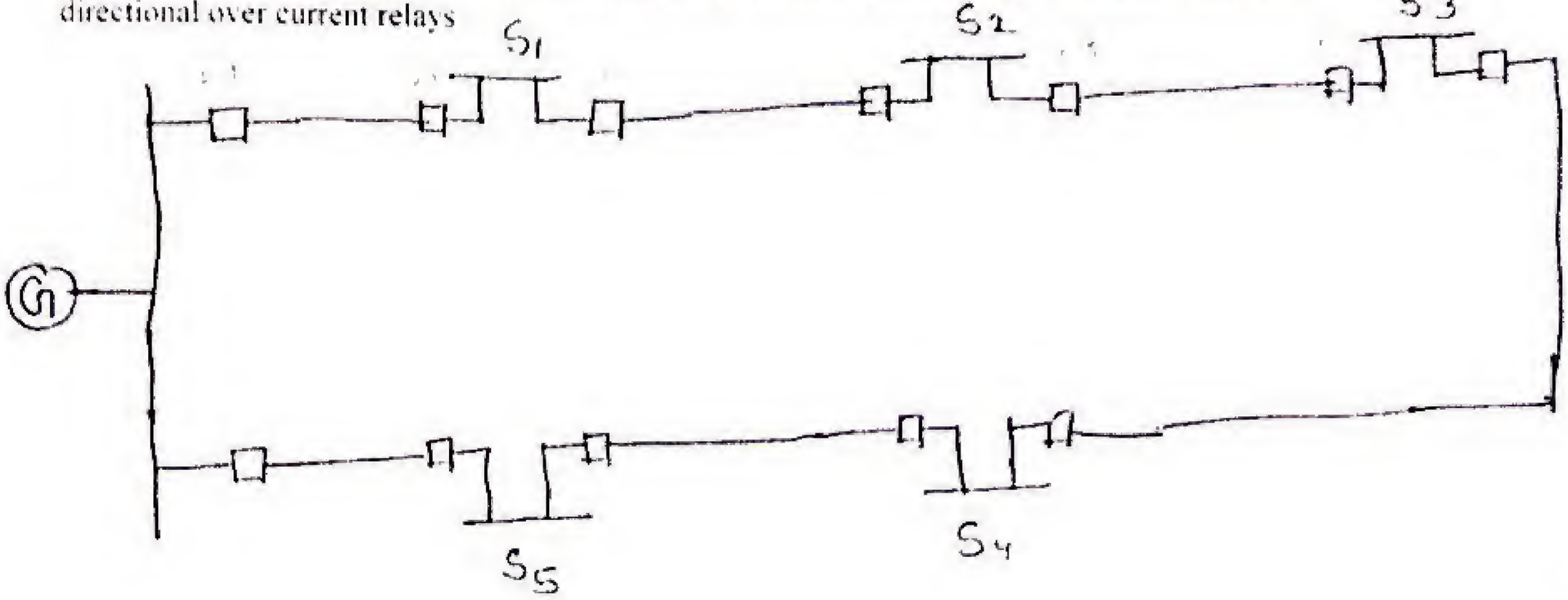
   c) Discuss the operating principle of Induction Type Directional Overcurrent Relay with proper diagram 9

PART- B

4. a) Write down the operating principle of Differential Current Relay 7

   b)Write down the difference among Instantaneous Over Current (Define Current) Relay, Define Time Over Current Relay and Inverse Time Over Current Relay (IDMT Relay) 4

c) For the following Ring main system design a protective system using directional and non-directional over current relays 5



d) For the following three phase bus system design an economical protective system with only Over Current relay which ensures both over current protection and earth fault protection 5

c) What is *three-zone* protection system in a line? Discuss briefly 4

5. a) A 3-phase transformer of 220/11000 line volts is connected in star/delta. The protective transformer on 220V side has a current ratio of 600/5. What should be the CT ratio on 11000 V side? Suppose line current on 220 V side is 600 A. 7

b) As a system engineer if you want to give protection to generator from Phase to ground fault and Phase to Phase fault then which protection scheme do you employ? Describe how does your scheme will give protection against above fault? 10

c) Discuss the operation of Buchholz relay with detail figure. 8

6. a) How Combined Leakage and Overload Protection can be given to a transformer? 8

b) What is voltage surge? What are the internal causes of over voltage? What are the harmful effects of Lightening? What are the protective measures against lightening? 2+1+4+2

c) Explain how generator behaves during LOSS-OF-SYNCHRONISM , OVERSPEED and Loss of excitation. 5

d) How does a motor can be protected from overloading? 3

BEST of Luck for Your Future

Shahjalal University of Science & Technology

Department of Electrical & Electronic Engineering

4th year 2nd Semester Final Examination – December 2014

Course No: EEE 465

Course Title: Optoelectronics

Credits : 3.0 Full Marks : 100 Time : 3 Hours

[Answer any four questions taking two from each group]

Group A

Q1 (a) Define direct and indirect band gap materials with necessary figures. 6

(b) A 0.46μm thick sample of GaAs is illuminated with monochromatic light of hν=2Ev. The absorption coefficient α is $5X10^4 cm^{-1}$. The power incident on the sample is 10mW. 9

(a) Find the total energy absorbed per second (J/s) by the sample.

(b) Find the rate of excess thermal energy given up by the electrons to the lattice before recombination (J/s).

(c) Find the number of photons per second given off from recombination events, assuming perfect quantum efficiency.

(c) Find the E-k relationship for a free electron and relate it to the electron mass. 7

(d) Explain in brief how white light is produced by LED. 3

Q2 (a) Derive the Berr-Lambert law in case of optial absorption. Explain its significance. 7

(b) Describe some applications of optial absorptoin. 5

(c) Define minority carrier life time. Derive a general expression that describes the time evolution of the excess minority carrier concentration. 7

(d) Briefly describe the principle of operation of an acousto-optic Modulator. 6

Q3 (a) Write few distinguishing characteristics of LED display and LCD display. 5

(b) With proper alloy composition the energy bands of semiconductor changes-explain with specific example and diagram. 8

(c) With proper device structure explain how LED works. 6

(d) Given that the width of the relative light intensity versus photon energy spectrum of an LED is typically around $\sim k_B T$, what should be the line width $\Delta\lambda_{1/2}$ in the output spectrum in terms of wavelength? 6

Group B

Q4	(a)	What do you understand by degenerate semiconductor material?	3
	(b)	Explain the principle of operation of holography.	6
	(c)	What are the conditions required to fulfill to get lasing action?	6
	(d)	With necessary diagram and figure explain the principle of operation of semiconductor LASER diode.	6
	(e)	Explain buried heterostructure laser diode.	4
Q5	(a)	Write short notes on quantum efficiency and responsivity of a photodiode.	6
	(b)	Define photoconductivity. Prove that photoconductive gain, $G = \frac{\tau}{t_e}(1 + \frac{\mu_h}{\mu_e})$, where τ = mean recombination time, t_e = electron's transit time, μ_h = hole drift mobility, μ_e = electron drift mobility.	8
	(c)	Describe the operating principle of p-i-n photodiode.	6
	(d)	A Si PIN photodiode has an active light receiving area of diameter 0.4 mm. When radiation of wavelength 700 nm (red light) and intensity 0.1 $mWcm^{-2}$ is incident it generates a photocurrent of 56.6 nA. What would be the responsivity and QE of the photodiode at 700 nm?	5
Q6	(a)	An APD with a multiplication factor of 20 operates at a wavelength of 1.5μm. Calculate the quantum efficiency and the output photocurrent from the device if its responsivity at this wavelength is $0.6AW^{-1}$ and 10^{10} photons of wavelength 1.5μm are incident upon it per second.	6
	(b)	With block diagram briefly explain the operation of FSK of optical signal.	4
	(c)	Distinguish between homodyne and intradyne detection of optical modulated signal.	4
	(d)	How does Mach-Zehnder modulator work?	5
	(e)	A solar cell under an illumination of 100 Wm^{-2} has a short circuit current I_{sc} of 50mA and an open circuit output voltage V_{oc} of 0.55 V. What is the short circuit current and open circuit voltage if the light intensity is halved?	6

Shahjalal University of Science and Technology
Department of Electrical and Electronic Engineering
Final Examination June-Dec. 2014

Course Code: EEE 491 — Time: 3hours
Course Title: Biomedical Instrumentation — Total Marks: 100

Part A

Answer any two of the following questions.

1. a) Define: i) Biometrics ii) Man-instrument system — 4
   b) What is a Transducer? Explain briefly with their biomedical application of the following transducer. i) Inductive transducer ii) Piezoelectric transducer iii) Capacitive transducer. — 6
   c) Describe the formation of resting and action potentials in a typical cell. — 7
   d) Briefly describe the cardiovascular circulation with a neat block diagram. — 8

2. a) 'Any portion of heart can act as pacemaker'-explain. Describe different modes of pacemaker operation. — 8
   b) Draw a typical ECG cycle and define its different waves. — 5
   c) What changes occur in ECG due to abnormality and why? Describe different types of cardiac abnormality detected by ECG. — 12

3. a) Define bradycardia and tachycardia. Derive the minimum sampling frequency required for the sampling of ECG to calculate IHR with an error of ±1 bpm. — 2+6
   b) With neat diagram describe the systole and diastole showing the relation among different cardiac activities. Also show the relationship of heart sounds to function of the cardiovascular system. — 8
   c) Define ECG lead. With neat diagrams, describe the formation of different ECG leads. — 1+8

Part B

Answer any two of the following questions

4. a) Write the basic physics of MRI. Describe the instrumentation and image formation in MRI. — 10
   b) Describe blood pressure measuring techniques. Describe the operation of a BP detector circuit. — 12
   c) Write the uses of EEG — 3

5. a) Describe the scanning modes of medical ultrasongraphy. — 8
   b) With neat diagrams describe the operation of a colorimeter. — 12
   c) Describe ultrasonic blood flowmeters. — 5

6. a) Define different tests of blood normally conducted. — 11
   b) Describe the use of impedance plethysmography in determining thorax impedance and stroke volume. — 14

Department of Electrical and Electronic Engineering

Shahjalal University of Science and Technology

Course Code : EEE 485

Course Title : Cellular Mobile and Satellite Communication

4th year 2nd semester final examination, 2014, Session-2010-11

Total Marks : 100 Duration : 3hours

Part A

(Answer any two questions)

Q1. a) Show the various upgrade paths for 2G technologies. 4

b) Provide the timing diagram that illustrates how a call initiated by a mobile is established. 7

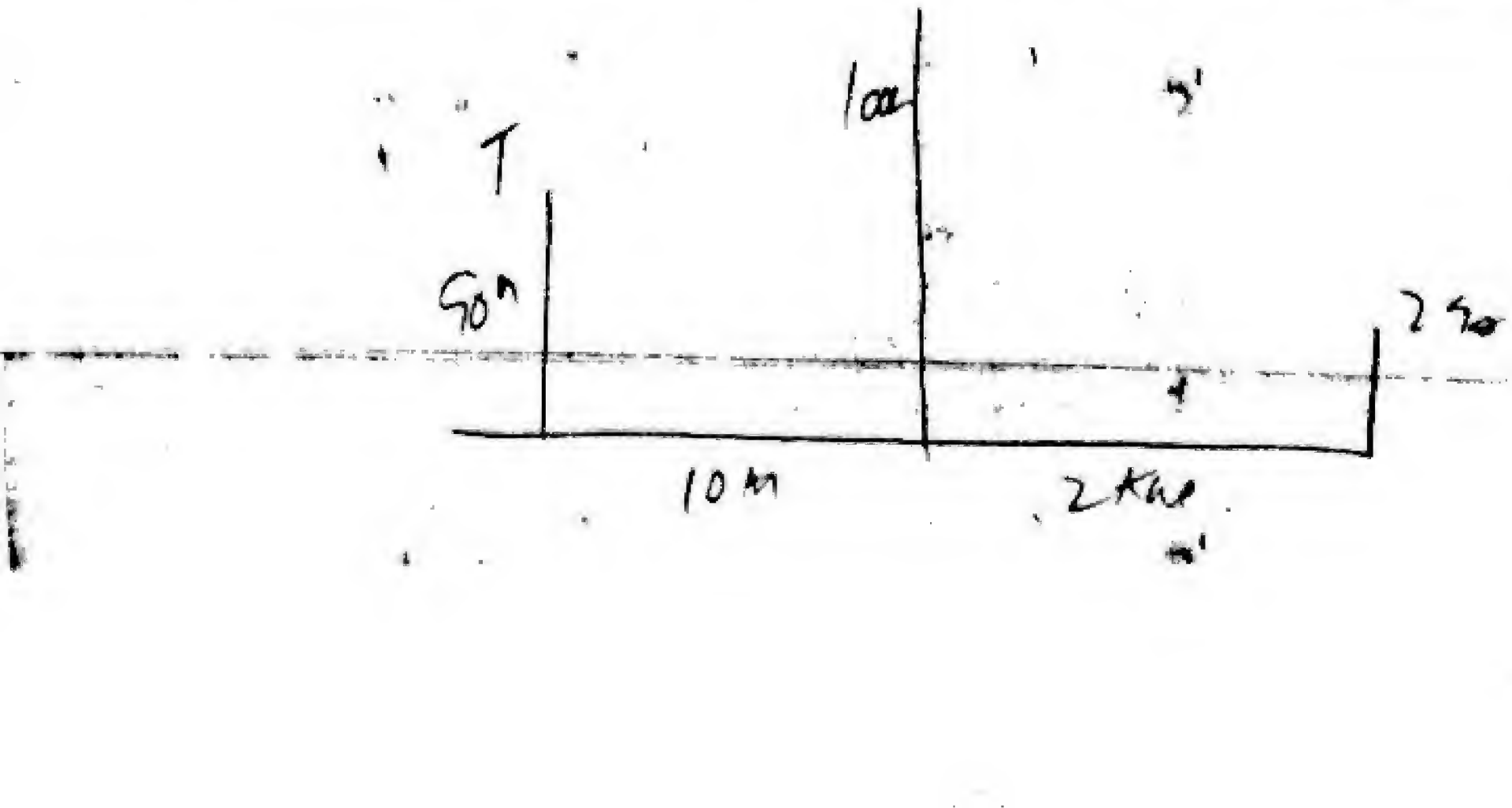
c) Discuss about handoff strategies and practical handoff considerations. 6

d) An urban area has a population of two million residents. Three competing trunked mobile networks (Systems A, B and C) provide cellular service in this area. System A has 394 cells with 19 channels each, system B has 98 cells with 57 channels each and system C has 49 cells each with 100 channels. Find the number of users that can be supported at 2% blocking if each user averages two calls per hour at average call duration of five minutes. Assuming that all three trunked systems are operated at maximum capacity, compute the percentage market penetration of each cellular provider. 8

Q2. a) What do you know about cell splitting and sectoring? Also explain how coverage and capacity is improved in cellular systems using these techniques. 8

b) Find the phase difference and time delay between two signals using ground reflection model. 6

c) Given the following geometry, determine (i) the loss due to knife edge diffraction and (ii) the height of the obstacle required to induce 6dB diffraction loss. Assume f=900MHz. 6

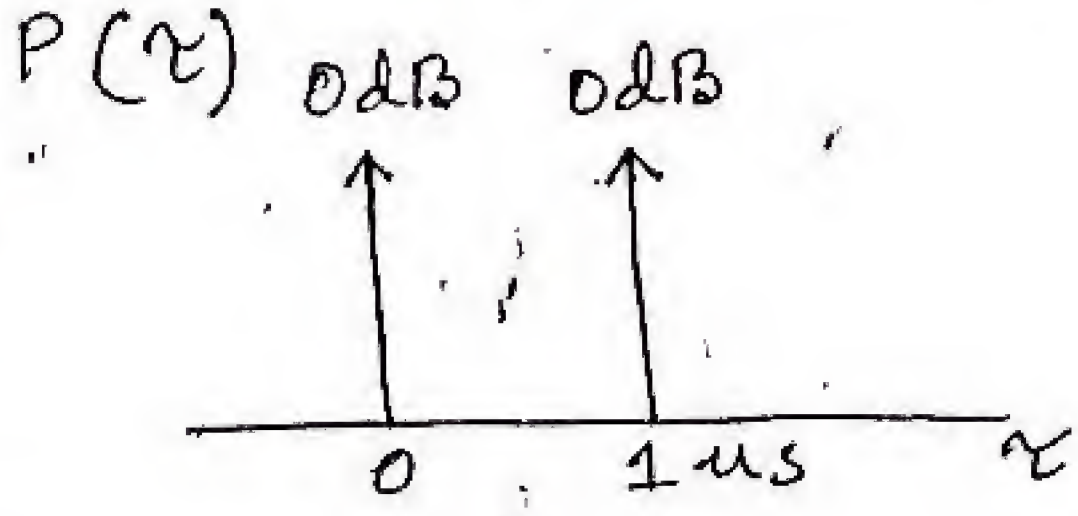


d) With a neat figure explain the basic subsystems of GSM architecture. 5

Q3. a) Define mean excess delay, rms delay spread and excess delay spread. 6

b) Compute rms delay spread for the following power delay profile. 6

(i)



(ii) If BPSK modulation is used, what is the maximum bit rate that can be sent through the channel without needing an equalizer?

c) Discuss about coherence bandwidth and coherence time. 5

d) Discuss about the different types of fading effects due to multipath time delay spread. 8

Part B

(Answer any two questions)

Q4. a) What do you know about DS-CDMA? Also write about forward link DS-CDMA and reverse link DS-CDMA. 5

b) Generate four bit Walsh codes. 5

c) Give information about forward pilot channel, forward sync channel, forward paging channel and forward traffic channel and reverse access channel. 10

d) Discuss about DS spectrum spreading and dispreading technique. 5

Q5. a) Define (i) True anomaly (ii) Eccentric anomaly (iii) Elevation angle (iv) Azimuth angle (v) Nadir angle. Draw necessary diagrams. 10

b) Provide the block diagram that depicts satellite communication system and interfacing with terrestrial entities. 5

c) Write down Kepler's laws. 5

d) What do you know about geostationary satellite? Give only five important information. 5

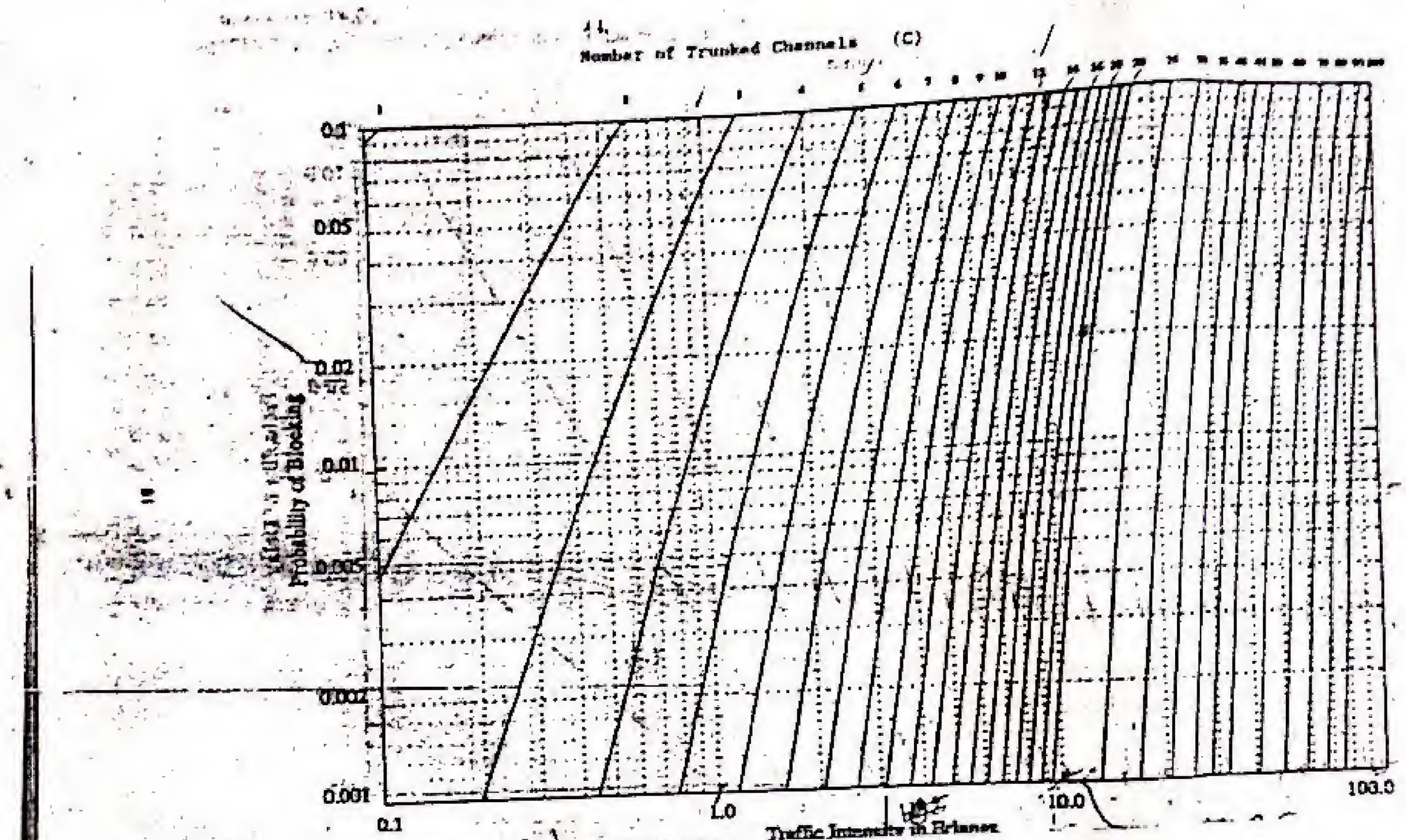
Q6. a) Give important information about MOLNYA and TUNDRA orbits. 6

b) What do you know about station keeping box? 5

c) Differentiate between CDMA and FDMA. 5

d) What do you know about Effective Isotropic radiated power and power flux density? 5

e) Discuss about the satellite communications links. Give specifications for 'C, 'X', 'Ka' and 'Ku' band. 4


Number of Trunked Channels (C)
0.1
0.05
0.02
0.01
0.005
0.002
0.001
Probability of Blocking
0.1
1.0
10.0
100.0
Traffic Intensity in Erlangs